

HYDRAULIC HOSE FITTING AND METHOD

Background of the Invention

Field of the Invention

5 This invention relates generally to hydraulic tube and hose couplings. More particularly, it relates to hose end fittings of such couplings. Specifically, it relates to improved collar and collar support portions of hose end fittings for tube and hose couplings.

Description of the Prior Art

10 Hydraulic couplings are known. The hose connection portion or fitting can include a tube or stem portion, a collar and optionally a ferrule. The collar fits about a middle region of the tube portion and is compressed or staked to affix it in place. The ferrule, if present, can also be staked about a portion of the collar to affix it in place. The tube portion has a hose insert portion, which is inserted into the open end of the hose. The ferrule is then compressed or crimped about the
15 hose end containing the insert trapping the hose between the ferrule and the hose insert portion. This causes all portions to be permanently sealed and affixed to prevent axial or rotational movement of the hose end. The hose connection fitting further may have a mating connection portion of many styles, including threaded, press-on, male, and female. Certain mating connection portion designs require the use of collars to make the manufacture of the associated
20 fittings possible. Mating this mating connection portion with the cooperating portion of the fitting connected to the subject fixture, machinery or equipment completes the particular hydraulic assembly that allows a fluid-tight transfer of fluid.

For those fittings having threaded mating connection portions, the collar will commonly include wrench flats to stabilize the fitting from rotating as the mating connection portion is
25 tightened to complete the mating with the cooperating portion of the fixture fitting. Ferrules are included in designs where the fitting and hose operate under severe axial loads that can be the result of high operating pressures or tensile loads imparted to the hose.

There is currently a stake collar design that retains the ferrule on the coupling hose end fitting while supporting a significant longitudinal load. However, this collar design will rotate relative
30 to the stem at fairly low torque values. This collar design is staked on one side of the collar only.

Further, a knurl has previously been used in conjunction with an internal spline on a collar to withstand high torque. However, this design cannot be used in cases of have high axial loads where a ferrule is required because it will not support the high axial loads. This collar design is also staked only on one side of the collar. It is also known to braze the collar to the stem. While this produces a fitting with a very secure collar, it is fraught with the manufacturing difficulties brazing introduces and the attendant increase in cost and complexity for its manufacture.

Accordingly, there is a continuing need for a hydraulic fitting having a separate collar that achieves improvement in both the characteristics of resistance of the collar to twisting relative to the stem when torque is applied to the wrenching portion of the collar and to axial displacement relative to the stem when forced by the ferrule reacting to forces imparted by the hose, without the drawbacks of including brazing.

Summary of the Invention

The present invention has as an object the provision of a hydraulic fitting with an improvement in the combination of characteristics including resistance of the collar to twisting relative to the stem when torque is applied to the wrenching portion of the collar and to axial displacement relative to the stem when loaded by the hose.

The present invention is an improved hydraulic fitting of the type having a stem including a hose insert portion, and a collar support portion. The fitting further has a mating connection portion, and a collar having, a torque communication portion, a ferrule support portion, and an inner periphery extending through the ferrule support portion and the torque communication portion. The fitting is improved by the collar support portion including knurling and an axial stop ring. Further, the torque communication portion of the collar is staked such that the inner periphery extending through the torque communication portion communicates with the knurling of the collar support portion of the stem in a relatively non-rotational manner. Also, the ferrule support portion of the collar is staked such that the inner periphery extending through the ferrule support portion communicates with the axial stop ring of the stem in an axial movement limiting manner.

Brief Description of the Drawings

The accompanying drawings, which are incorporated in and form part of the specification in which like numerals designate like parts, illustrate preferred embodiments of the present invention and together with the description, serve to explain the principles of the invention. In
5 the drawings:

FIG. 1 is a perspective view of a hydraulic fitting of a preferred embodiment;

FIG. 2 is an elevation of a hydraulic fitting, with one quarter cut-away, of a preferred embodiment;

FIG. 3 is perspective view, of a stem of a hydraulic fitting, of a preferred embodiment;

10 FIG. 4 is an elevation, with one quarter cut-away, of a stem of a preferred embodiment;

FIG. 5 is perspective view, of a collar of a hydraulic fitting, of a preferred embodiment;

FIG. 6 is an elevation, with one quarter cut-away, of a collar of a preferred embodiment;

FIG. 7 is a partial elevation, with one quarter cut away, of a preferred embodiment of a hydraulic fitting including a staking die;

15 FIG. 8 is a partial elevation, with one quarter cut away, of another preferred embodiment of a hydraulic fitting including a ferrule and a staking die; and,

FIG. 9 is an elevation of a hydraulic fitting, with one quarter cut-away, of another preferred embodiment.

20 Detailed description of the Preferred Embodiments

Referring to Figures 1 and 2, one preferred embodiment of this hydraulic hose fitting 10 includes stem 12 having barbs 14, over which is placed collar 16 having wrench flats 18. Also placed over stem 12 is nut 20 having nut abutment 44. The process of staking collar 16 upon stem 12 leaves stake marks 22. Greater detail of stem 12 can be viewed in Figures 3 and 4.
25 Specifically, knurling 24, axial stop ring 26, assembly stop ring 28, ramp 30, and stem abutment 32 are apparent. Greater detail of collar 16 can be viewed in figures 5 and 6. Specifically, ferrule depression 34, axial retention ridge 36, assembly ridge 38, knurling mating surface 40, and free surface 42 are apparent. Collar 16 can be viewed as having torque communication portion D and ferrule support portion E.

Assembly of this preferred embodiment includes placing nut 20 over stem 12 until nut abutment 32 becomes near or proximate to stem abutment 44, as depicted. Then, collar 16 is placed over stem 12 until assembly ridge 38 abuts assembly stop ring 28. Assembly stop ring 28 is optional. In some instances, the difference in diameters of barbs 14 and the portion of stem 12 having knurling 24 are to similar to allow assembly stop ring 28 to be distinct. Where assembly stop ring 28 is available and distinct, assembly stop ring 28 and assembly ridge 38, aided by ramp 30, provide easy reference to locate collar 16 upon stem 12. Referring to Figure 7, the three pieces once assembled in this manner are placed in a swaging tool, of common design (not depicted), having multiple staking dies 46. For the fitting depicted, the staking dies commonly number eight. The swaging tool presses staking dies 46 against collar 16 on both sides of wrench flats 18 with adequate force to, at once, compress collar 16 to the point where axial retention ridge 36 takes on a diameter smaller than axial stop ring 26 and knurling mating surface 40 is forcefully compressed against knurling 24, as depicted in Figure 2. This operation is evidenced by the staking marks 22 left behind. Thus with a single operation nut 20 is trapped onto stem 12, collar 16 is affixed to stem 12 with a high degree of resistance to rotation upon stem 12 and affixed with a high degree of resistance to being dislodged axially. The result is a hydraulic hose fitting that has been assembled very efficiently and is very robust for applications demanding substantial torque be placed upon the fitting during mating to an apparatus fitting (not depicted) as well as being subjected to substantial axial loads during use.

The fitting can be viewed as having hose insert portion A, collar support portion B, and mating connection portion C. In use, hose insert portion A of fitting 10 is inserted into an open end of a hydraulic hose (not depicted). The hose is sealingly clamped in place. For greatest resistance to the hose being axially separated from fitting 10, a ferrule 48 is used for this clamping function. Ferrule 48 can first be staked upon collar 16 at ferrule depression 34 of ferrule support portion E. Ferrule 48 would then be crimped about the connection end of the hose. Ferrule 48 can also be crimped upon collar 16 before, after, or during crimping upon the hose. The completion of the fluid tight connection involves attachment to a machine or other apparatus (not depicted). Such machine or apparatus will have a machine or apparatus fitting (not depicted) adapted to mate with fitting 10. Nut 20 of mating connection portion C will be tightly threaded upon the apparatus fitting. The tightening will entail applying a wrench to nut

20 to apply tightening torque and applying a wrench to wrench flats 18 to apply stabilizing torque to stem 12 to avoid twisting the hose or fitting 10 within the hose. The instant invention allows very substantial stabilizing torque to be applied that heretofore was unavailable on fittings having collars 16 separate from stems 12 that could also support substantial axial loads.

5 This preferred embodiment includes free surface 42 on collar 16. This allows simplicity in the staking process by eliminating the need for non-standard six-finger stake dies and eliminating the need for indexing in relation to wrench flats 18. In some cases, this also allows greater space for nut 20 to be retracted while unthreaded from the male threads of an apparatus or machine fitting (not depicted). However, it allows stake marks 22 be visible at torque communication
10 portion D, which may be regarded as unsightly.

Another preferred embodiment is depicted in Figures 8 and 9. In this embodiment, collar 18 does not include free surface 42. Accordingly, the space available for movement of nut 20 when unthreaded is limited for any given overall length of fitting 10. It has the advantage that the staking process can be applied to wrench flats 18 allowing enough surface area to be involved to
15 preclude leaving the unsightly staking marks 22. However, non-standard six-finger staking dies are required. Figure 8 depicts fitting 10 just prior to the staking process and includes ferrule 48 positioned for staking. Figure 9 depicts fitting 10 after completion of staking. As with the prior embodiment, this embodiment can be produced with or without ferrule 48.

The net result of the instant invention are hydraulic fittings having collars that can withstand
20 both substantial torque and axial force, relative to the stem, and do not require brazing in their manufacture.

The foregoing description and illustrative embodiments of the present invention have been shown on the drawings and described in detail in varying modifications and alternative embodiments. It should be understood, however, that the foregoing description of the invention
25 is exemplary only, and that the scope of the invention is to be limited only to the claims as interpreted in view of the prior art. Moreover, the invention illustratively disclosed herein suitably may be practiced in the absence of any element which is not specifically disclosed herein.